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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/065,018	09/11/2002	Marc Schaepkens	125397	7553

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GENERAL ELECTRIC COMPANY
GLOBAL RESEARCH
PATENT DOCKET RM. BLDG. K1-4A59
NISKAYUNA, NY 12309

EXAMINER	
LEURIG, SHARLENE L	

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 09/21/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/065,018	SCHAEPKENS ET AL.	
	Examiner	Art Unit	
	Sharlene Leurig	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-53* is/are pending in the application.

4a) Of the above claim(s) *1-20,36-39 and 50-53* is/are withdrawn from consideration.

5)☒ Claim(s) *49* is/are allowed.

6)☒ Claim(s) *21-35 and 40-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *08132004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment filed on June 5, 2004 has been entered and acknowledged by the examiner.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 21-25, 40, 41 and 45-47 stand rejected under 35 U.S.C. 102(e) as being anticipated by Graff et al. (6,522,067) (of record).

Regarding claims 21 and 40, Graff discloses a light-emitting device comprising a flexible (column 2, line 22), transparent substrate (105) having a first and a second surface, one of which is coated with a graded-composition barrier coating having a continuously-varying composition across its thickness, as it is formed of a mixture of two or more types of material (column 2, lines 9-12), and an organic electroluminescent device (120) comprising an organic EL layer (210) disposed between two electrodes (200 and 220) that is disposed on the substrate.

Regarding claims 22 and 45, Graff discloses a transparent film (220) having a second graded-composition barrier layer (170) formed thereon. The transparent film is disposed on the OLED (120) opposite the flexible substrate (105).

Regarding claim 23, Graff discloses a flexible, transparent substrate made of polyethyleneterephthalate, polyimide, polyethersulfone, and other polymers (column 5, lines 9-15).

Regarding claims 24 and 25, Graff discloses a coating material (140 and 170) made from a combination of inorganic, ceramic materials, including combinations of oxides, carbides and nitrides of silicon, aluminum, titanium, indium and tin (column 2, lines 9-12).

Regarding claim 41, Graff discloses the method of making a light-emitting device comprising the steps of depositing a first electrically conducting material (200) on the barrier coating (140), depositing the organic EL layer (210) on the first electrode, and forming a second electrode (220) by depositing a second electrically conducting material on the organic EL layer.

Regarding claim 46, Graff discloses disposing a second flexible substrate (190) on the organic EL member (120), the second substrate having a second graded-composition barrier coating (170) thereon.

Regarding claim 47, Graff discloses a method of making a light-emitting device comprising the steps of providing a flexible, transparent substrate (105), depositing a first graded-composition barrier coating (140) by plasma-enhanced chemical vapor deposition, sputtering and electron-cyclotron-resonance-plasma-enhanced chemical

vapor deposition (column 4, lines 56-65), disposing an organic EL member (120) comprising an organic EL layer disposed between two electrodes on the flexible substrate, and disposing a transparent film (180) coated with a second graded-composition barrier coating on the organic EL member, the second graded-composition barrier coating being deposited second graded-composition barrier coating.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 26, 42, 43 and 48 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Graff et al. (6,522,067) (of record) in view of Baldo et al. (6,097,147) (of record).

Graff discloses an OLED coated with a graded-composition barrier coating having a continuously-varying composition across its thickness.

Graff lacks disclosure of a reflective layer formed near the OLED.

Baldo teaches a reflective metal layer (116) formed over the light-emitting layer in order to reflect impinging light beams that would reduce the display quality of the device (column 4, line 2).

Regarding claim 42, Baldo teaches a placement of the reflective layer between the light-emitting layer and the cathode that is opposite the transparent substrate (110).

Regarding claim 43, Graff discloses a second graded-composition barrier coating (130) that is formed over the cathode (220). The placement of the reflective layer taught by Baldo would be between the cathode and the light-emitting layer (210) and therefore the second barrier coating would be coated on the reflective layer.

Regarding claim 48, Graff discloses a substantially transparent film (190). The reflective layer taught by Baldo is disposed over the emitting layer but under the cathode. Therefore the placement of the reflective layer if combined with Graff would be between the organic EL layer and the transparent film.

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the OLED disclosed by Graff to have a reflective metal layer formed over the emitting layer in order to reflect light beams that would reduce the display quality of the device, as taught by Baldo.

6. Claims 27, 28, 32 and 33 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Graff et al. (6,522,067) (of record) in view of Wolk et al. (6,291,116) (of record).

Graff discloses a light-emitting device comprising a flexible (column 2, line 22), transparent substrate (105) having a first and a second surface, one of which is coated with a graded-composition barrier coating having a continuously-varying composition across its thickness, as it is formed of a mixture of two or more types of material (column 2, lines 9-12), and an organic electroluminescent device (120) comprising an organic EL layer (210) disposed between two electrodes (200 and 220) that is disposed

on the substrate. Graff discloses a flexible, transparent substrate made of polyethyleneterephthalate, polyimide, polyethersulfone, and other polymers (column 5, lines 9-15). Graff discloses a coating material (140 and 170) made from a combination of inorganic, ceramic materials, including combinations of oxides, carbides and nitrides of silicon, aluminum, titanium, indium and tin (column 2, lines 9-12).

Graff lacks disclosure of the materials forming the organic light-emitting layers.

Regarding claims 27 and 33, Wolk teaches an OLED having a layer of poly(n-vinylcarbazole) for the hole transporting layer (column 23, Table 5).

Regarding claims 28 and 33, Wolk teaches perylene as a dopant for the electron transporting layer (column 30, lines 52).

Regarding claim 32, Wolk teaches a hole transport layer formed between the anode and the emitter layer, which enhances the transport of holes, as an alternative structure to an emissive device having no distinct emissive layer, and further teaches both a hole blocking layer and an electron blocking layer formed between the anode and the cathode and the emitting layer, which enhances the injection and transport of holes and electrons into the recombination layer (column 15, lines 12-20).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the OLED disclosed by Graff to have a hole transport layer formed of a material such as a vinylcarbazole, to have an electron transporting layer doped with perylene, and to have additional layers formed between the electrodes and the emitting layer to improve the transport and injection of electrons and holes, all as

taught Wolk, in order to provide an OLED having well-understood and readily-available materials that enhance light emission.

7. Claims 29-31 and 44 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Graff et al. (6,522,067) (of record) in view of Collins, III et al. (6,642,652) (of record).

Graff discloses an OLED coated with a graded-composition barrier coating having a continuously-varying composition across its thickness.

Graff lacks disclosure of a scattering layer or a phosphor layer.

Collins teaches an LED having a phosphor for absorbing light emitted from the EL layer and re-emitting light of a different wavelength (column 2, lines 48-51) embedded in a silicone polymer matrix (column 5, lines 38-65). The phosphor may be (Y,Gd).sub.3 Al.sub3 O.sub.12:Ce (column 5, line 49) or a variety of other yttrium aluminum garnet phosphors (column 7, lines 58-62). Collins teaches that this phosphor layer may further contain particles of titanium oxide that scatter the light to improve the scattering of the light emitted from the active region of the LED to thereby increase the absorption of light by the phosphor particles (column 5, line 65 to column 6, line 7). The light emitted by the phosphor is in the visible EM range (column 5, lines 52-56).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the OLED disclosed by Graff to have a phosphor layer in order to offer more variety of the wavelengths of light that can be emitted from the device, and to further modify the layer containing the phosphor particles to have

scattering particles therein in order to improve the amount of light converted, as taught by Collins.

8. Claim 34 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Graff et al. (6,522,067) (of record) in view of Baldo et al. (6,097,147) (of record), and further in view of Wolk et al. (6,291,116) (of record).

Graff discloses a light-emitting device comprising a flexible (column 2, line 22), transparent substrate (105) having a first and a second surface, one of which is coated with a graded-composition barrier coating having a continuously-varying composition across its thickness, as it is formed of a mixture of two or more types of material (column 2, lines 9-12), and an organic electroluminescent device (120) comprising an organic EL layer (210) disposed between two electrodes (200 and 220) that is disposed on the substrate. Graff discloses the transparent film (220) has a second graded-composition barrier layer (170) formed thereon. The transparent film is disposed on the OLED (120) opposite the flexible substrate (105). Graff discloses a flexible, transparent substrate made of polyethyleneterephthalate, polyimide, polyethersulfone, and other polymers (column 5, lines 9-15). Graff discloses a coating material (140 and 170) made from a combination of inorganic, ceramic materials, including combinations of oxides, carbides and nitrides of silicon, aluminum, titanium, indium and tin (column 2, lines 9-12).

Graff lacks disclosure of a reflective layer formed near the OLED.

Baldo teaches a reflective metal layer (116) formed over the light-emitting layer and opposite the substrate in order to reflect impinging light beams that would reduce the display quality of the device (column 4, line 2).

Graff further lacks disclosure of the materials forming the light-emitting layers.

Wolk teaches an OLED having a layer of poly(n-vinylcarbazole) for the hole transporting layer (column 23, Table 5) and perylene as a dopant for the electron transporting layer (column 30, lines 52).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the OLED disclosed by Graff to have a reflective layer formed over the light-emitting layer opposite the substrate in order to reflect light beams that would reduce the display quality of the device, as taught by Baldo, and to further modify it to have light-emitting layers formed of perylene and poly-n-vinylcarbazole, as taught by Wolk, in order to provide well-understood materials for good light emission.

9. Claim 35 stands rejected under 35 U.S.C. 103(a) as being unpatentable over Graff et al. (6,522,067) (of record) in view of Baldo et al. (6,097,147) (of record), and further in view of Wolk et al. (6,291,116) (of record) as applied to claim 34 above, and further in view of Collins, III et al. (6,642,652) (of record).

Graff discloses an OLED having all the limitations discussed above with regard to claim 34, but lacks disclosure of a reflective layer or the materials of the light-emissive layers.

Baldo teaches a reflective layer to reflect impinging light beams.

Wolk teaches perylene and poly-n-vinylcarazole as materials for the light-emissive layers.

Graff, Baldo and Wolk lack disclosure of a scattering layer having phosphor particles.

Collins teaches an LED having a phosphor for absorbing light emitted from the EL layer and re-emitting light of a different wavelength (column 2, lines 48-51) embedded in a silicone polymer matrix (column 5, lines 38-65). Collins teaches that this phosphor layer may further contain particles of titanium oxide that scatter the light to improve the scattering of the light emitted from the active region of the LED to thereby increase the absorption of light by the phosphor particles (column 5, line 65 to column 6, line 7).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the OLED disclosed by Graff to have a reflective layer formed over the light-emitting layer opposite the substrate in order to reflect light beams that would reduce the display quality of the device, as taught by Baldo, and to further modify it to have light-emitting layers formed of perylene and poly-n-vinylcarbazole, as taught by Wolk, in order to provide well-understood materials for good light emission, to further modify it to have a phosphor layer in order to offer more variety of the wavelengths of light that can be emitted from the device, and to further modify the layer containing the phosphor particles to have scattering particles therein in order to improve the amount of light converted, as taught by Collins.

Allowable Subject Matter

10. Claim 49 is allowed.

11. The following is an examiner's statement of reasons for allowance: the prior art of record teaches forming a barrier coating on a substrate of an OLED by any number of techniques, including sputtering and several plasma deposition techniques, but lacks teaching or suggestion of applying the barrier coating onto the substrate in such a way that the barrier coating penetrates into the substrate.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

12. Applicant's arguments filed June 5, 2004 have been fully considered but they are not persuasive.

The applicant has argued that the applied references do not teach or suggest a graded-composition barrier coating having a composition which varies continuously across its thickness. Specifically, the applicant has argued that the applied Graff reference discloses a barrier stack consisting of a plurality of separate layers, each distinct from the next layer with a distinct interface separating them, each being sequentially disposed on the substrate.

The examiner does not disagree that Graff discloses a stack of distinct layers. However, the examiner directs the applicant to column 2, lines 9-12, which states that "at least one of the first and second barrier **layers** preferably comprises a material selected from metal oxides, metal nitrides, metal carbides, metal oxynitrides, **and combinations thereof**". Therefore Graff does disclose a coating layer having a composition varying continuously across its thickness, as Graff discloses that a single barrier layer may be formed of a mixture of any of the disclosed materials. A mixed layer is a layer having a continuously varying composition across its thickness.

Therefore the rejections are maintained.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Misiano et al. (5,462,779) (of record), supplied in the applicant's IDS of August 13, 2004, teaches a mixed aluminum oxide-silicon oxide layer on a flexible and transparent PET substrate, where the ratio of the mixture of oxides changes linearly across the layer (column 3, lines 58-64). Therefore Misiano teaches a graded-composition barrier coating having a composition varying continuously across its thickness.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharlene Leurig whose telephone number is (571) 272-2455. The examiner can normally be reached on Monday through Friday, 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

sll

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